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SONNENSCHN NATH & ROSENTHAL LLP  
P.O. BOX 061080  
WACKER DRIVE STATION, SEARS TOWER  
CHICAGO, IL 60606-1080

EXAMINER

CANTELMO, GREGG

ART UNIT	PAPER NUMBER
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1745

DATE MAILED: 02/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/837,847

Applicant(s)

NIRASAWA ET AL. 

Examiner

Gregg Cantelmo

Art Unit

1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 03 November 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1,3-7 and 9-11 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-7 and 9-11 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

## **DETAILED ACTION**

### ***Response to Amendment***

1. In response to the amendment received November 3, 2003:
  - a. Claims 1, 3-7 and 9-11 are pending. Claims 2, 8 and 12 have been cancelled as per Applicant's request,
  - b. The 112 second paragraph rejections have been withdrawn in light of the amendment;
  - c. The prior art rejections of record are withdrawn in light of the amendment;
  - d. The amendment to claim 1 presents new claim limitations (such as the particulars to the graphite material of the negative electrode active material) which were not claimed previously. This permits finality of this office action necessitated by amendment.

### ***Claim Objections***

2. Claim 7, in part, is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Amended claim 1 recites a negative electrode active material of graphite which is exemplary of a carbonaceous material. The species of claim 7 drawn to a negative electrode active material comprising at least one selected from carbonaceous material, crystallized

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metal oxide and amorphous metal oxide is objected to since it would already appear that a carbonaceous material is present in the active material in the negative electrode of claim 1. If the term carbonaceous material of claim 7 is redundant, then Applicant is advised to delete this species from claim 7 to overcome the objection.

3. Claims 1, 3-7 and 9-11 are objected to because of the following informalities:

Claim 1 recites "... the nonaqueous electrolyte is selected from the group consisting of ... thioacetates, aromatic sulfones is in the range ..." at lines 21-23. Applicant is advised to correct the grammatical error(s) in the claim. In addition the apparent Markush group should have the term "and" between the second to last and last species of the group. A suggested claim amendment is provided in item 7b below. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claim 6 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 6 previously recited that the active material for the negative electrode comprises "a carbonaceous material or at least one metal which

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alloys with lithium". In the construct of the originally presented claims, this limitation was acceptable. Amended claim 1 now recites that the negative electrode active material is a graphite material (i.e., carbonaceous material). Amended claim 6 has deleted the term carbonaceous material and is now limiting only to a metal which alloys with lithium. There is no support in the original disclosure of a negative electrode active material comprising both graphite and a metal which alloys with lithium, as defined in claim 6. Therefore this combination does not appear to have been appreciated at the time the instant claimed invention was made and is held as new matter.

6. Claim 7 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Alternative to the interpretation of claim 7 set forth in item 2 above and in the event that the interpretation of claim 7 as defined therein is incorrect, the combination is then subject to a new matter rejection. In particular the combination teaches of a graphite material (claim 1) and then at least one material selected from the group consisting of carbonaceous materials and metal oxides (as defined in claim 7). While there is support in the original disclosure for a negative electrode active material comprising at least one selected from a carbonaceous material, crystallized metal oxide and amorphous metal oxide, there is no teaching or support in the original disclosure for a negative electrode active material comprising the graphite of claim 1 in combination

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with another or second carbonaceous material with or without the metal oxide(s) as defined in claim 7.

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1, 3-7 and 9-11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a. The particulars of the graphite material in claim 1 are not clear. The claim recites a "graphite material" having a "shape parameter X" with "the shape particle X" being defined by a particular relationship. It is unclear whether the term "shape particle X" is distinct from the term "shape parameter X" or is drawn to the same "shape parameter X". It would appear that the term "the shape particle X" should be "the shape parameter X" in light of the teachings of the specification and the claim should be amended to reflect this. If the two terms are in fact argued as distinct, then the variable X being 125 or less (to the "shape parameter X") would not be clear since the relationship X of the shape parameter X is not defined, only the variable X of the "shape particle X" would then be defined by the claim. In review of the original disclosure the term "shape particle X" should be amended to "shape parameter X"(line 14) and additionally by removing the term "shape particle X", the term "the particle" should be amended to "the graphite material" (line 16) This also applies to claims 3-7 and 9-11;

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b. Claim 1 recites that the electrolyte is "selected from the group consisting of thiols ...aromatic sulfones is in the range of 0.03 percent by weight to 10 percent by weight of the entire electrolyte". The language consisting of is limiting the electrolyte only to those elements defined therein. That being the case, then it is unclear how the entire electrolyte, which consists only of those materials recited in claim 1 is only a percentage of weight of the entire electrolyte when the phrase "electrolyte selected from the group consisting of" is held to limit the electrolyte only to those materials listed in the Markush group and excludes other electrolyte materials apart from those specified in the group. Use of the closed-ended terminology "... electrolyte selected from the group consisting of ..." in claim 1 would render the scope of claims 9-11 beyond that which claim 1 is entitled to because claims 9-11 are drawn to additional components of the electrolyte apart from the group specified in claim 1. The claim has been interpreted that a component of the electrolyte is selected from the group as defined in claim 1. As such the phrase "... the nonaqueous electrolyte is selected from ...by weight of the entire electrolyte ..." should be amended to "... the nonaqueous electrolyte comprising, in a range of 0.03 percent by weight to 10 percent by weight of the nonaqueous electrolyte, a material selected from the group consisting of thiols, thiophenes, thioanisoles, thiazoles, thioacetates and aromatic sulfones" to overcome the objection in item 3 above and the rejection of item 7b herein;

c. Claim 7 is indefinite with respect to the exact combinations of active materials present in the claimed invention. As set forth in items 2 and 5 above, the scope of claim 7 in its entirety is unclear as to whether the active material is graphite as recited in claim 1 and further at least one selected from a carbonaceous material and metal oxide materials as recited in claim 7 or if the carbonaceous material as recited in claim 7 is actually the graphite material as set forth in claim 1. The claim has been interpreted in light of the specification to be the latter.

***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 1, 3, 4, 5, 7, and 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over EP 713258-A (EP '258) in view of U.S. patent No. 6,413,677 (Hamamoto).

EP '258 discloses a nonaqueous electrolyte secondary battery comprising a positive electrode containing active material, negative electrode containing active material which can be doped/undoped with lithium, a nonaqueous electrolyte, separator and a casing 5 (abstract and page 9, line 57 through page 10, line 31). The positive electrode comprises a positive electrode sheet, aluminum foil 11 with positive active material coated on both sides of the electrode sheet 11 (page 10, lines 17-19). The

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negative electrode comprises a negative electrode sheet, copper foil 10, with negative active material on both surfaces of the sheet 10 (page 10, ll. 4-6). The negative electrode active material comprises graphite with a true density of  $2/1 \text{ g/cm}^3$  a (002) interplanar distance of less than 0.340 nm (page 4, ll. 50-52) and an average value of the shape parameter X of 125 or less, the shape particle X (shape parameter X?) being equal to  $(W/T) \times (L/T)$ , W being the length of a parameter in a direction perpendicular to the longitudinal axis, T being the thickness of the thinnest portion of the particle, L being the length of the particle in the longitudinal direction (abstract and page 5, ll. 15-25), the electrodes are stacked with the separator between the electrodes and rolled to form spirally wound electrodes (page 10, ll. 23-26), the spirally wound electrodes accommodated within casing 5 (page 10, ll. 23-26). A nonaqueous electrolyte is provided to the battery (page 10, ll. 27-31 as applied to claim 1).

The positive electrode active material comprises a lithium containing metal oxide of  $\text{LiCoO}_2$  (page 10, ll. 7-19 and page 7, ll. 34-37 as applied to claim 4).

The positive electrode active material comprises  $\text{LiCoO}_2$  as discussed above and is representative of a composite oxide of lithium and a transition metal by the general formula  $\text{LiM}_x\text{O}_y$ , wherein M is at least one selected from the group consisting of Co, Ni, Mn, Fe, Al, V and Ti (page 10, ll. 7-19 and page 7, ll. 34-37 as applied to claim 5).

In the event that the term carbonaceous in claim 7 is representative of the specific graphite as recited in claim 1, the graphite material of EP '258 as discussed above is exemplary of a specific carbonaceous material (as applied to claim 7).

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The nonaqueous electrolyte is a liquid electrolyte prepared by dissolving an electrolyte salt into a nonaqueous solvent (page 8, ll. 17-19 as applied to claim 9).

While claim 10 defines the particular of the polymer matrix, claim 10 does not positively require that the polymer matrix electrolyte is selected from the group of materials in claim 9 (claim 10 serves only to define one of the species of claim 9 without requiring that the electrolyte is chosen to be a polymer electrolyte). Thus the limitations of claim 10 would only be accorded weight provided that claim 10 clearly limited or selected the polymer electrolyte species recited in claim 9 as a component of the electrolyte material (as applied to claim 10). Since it does not, and the prior art of EP '258 discloses dissolving an electrolyte salt into a nonaqueous solvent, claim 10 does not further limit the invention relative to dissolving an electrolyte salt into a nonaqueous solvent (as applied to claim 9).

The electrolyte salts include  $\text{LiClO}_4$ ,  $\text{LiAsF}_6$ ,  $\text{LiPF}_6$ ,  $\text{LiBF}_4$ , etc. (page 8, ll. 17-19 as applied to claim 11).

The differences between claims 1 and 3 and EP '258 are that EP '258 does not teach of the electrolyte consisting of the additive materials recited in claim 1 in the percentage weight set forth therein, of the specific thiol materials of claim 3.

With respect to the electrolyte comprising a material selected from the group consisting of thiols, thiophenes, thioanisoles, thiazoles, thioacetates and aromatic sulfones in the range of 0.03- 10 wt % of the electrolyte (claim 1).

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Hamamoto discloses a non-aqueous electrolyte secondary battery (abstract lines 1-2) comprising a positive electrode having a positive electrode active material (col. 6, ll. 53-65), a negative electrode containing a negative electrode active material capable of being doped with lithium (col. 7, ll. 1-13) and a non-aqueous electrolyte, wherein the non-aqueous electrolyte comprises a thiol (col. 2, ll. 36-40 as applied to claim 1). The thiol is in a weight percentage from 0.01-10 percent by weight based upon the total weight of the electrolyte (prior art claim 7 as applied to claim 1).

The motivation for providing a thiol additive to the electrolyte as taught by Hamamoto is that it provides a battery having improved cycling, capacity and storage characteristics (paragraph bridging columns 1 and 2).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of EP '258 by providing a thiol additive to the electrolyte as taught by Hamamoto since it would have provided a battery having improved cycling, capacity and storage characteristics.

10. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over EP '258 in view of Hamamoto as applied to claim 1 above, and further in view of U.S. patent No. 6,030,726 (Takeuchi).

The difference not yet discussed is of the negative electrode active material further comprising at least one metal which alloys with lithium (claim 6).

Takeuchi discloses of providing a negative electrode material which further has a metal additive for alloying with lithium (paragraph bridging columns 6 and 7).

The motivation for adding a metal to the graphite active material in the negative electrode are the discharging capacity is increased, (2) the output power density is improved, (3) the electroconductivity is improved, and the charging-discharging velocity is increased, (4) a charging-discharging capacity exceeding the theoretical capacity of graphite, can be obtained, because the charging-discharging capacity of the alloy formed by the additive metal with lithium can be utilized, (5) the irreversible capacity can be reduced, because reaction sites on the surface of the carbon particles, which cause the irreversible capacity, are covered with the borne metal, (6) the output power density of the battery is naturally increased, because the discharging capacity is increased, (7) the cycle characteristics are improved with the improvement (2), and thermal radiation of a batteries can also be improved.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of EP '258 by adding a lithium alloying metal to the graphite active material in the negative electrode since it would have increased the discharge capacity, improved the output power density, improved the electroconductivity, increased the charging-discharging velocity, obtained a charging-discharging capacity exceeding the theoretical capacity of graphite, reduced the irreversible capacity, improved the cycle characteristics and thermal radiation of the battery.

11. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over EP '258 in view of Hamamoto as applied to claim 1 above, and further in view of JP 08-007886-A (JP '886).

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In the alternative that the term "carbonaceous material" in claim 7 is a further carbonaceous material, the claimed limitations are further obvious as set forth herein.

The difference not yet discussed is of the negative electrode active material further comprising a crystallized or amorphous metal oxide (claim 7).

JP '886 discloses of adding a metal oxide (inherently either crystalline or amorphous) to graphite active material in the negative electrode (abstract)

The motivation for adding a metal oxide to the graphite active material in the negative electrode is that it slows the final discharge stage of the battery which permits easier detection of the remaining capacity of the battery.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of EP '258 by adding a metal oxide to the graphite active material in the negative electrode since it would have slowed the final discharge stage of the battery and permitted easier detection of the remaining capacity of the battery.

### ***Response to Arguments***

12. Applicant's arguments with respect to claims 1, 3-7 and 9-11 have been considered but are moot in view of the new ground(s) of rejection.

The amendment further defines claim 1. Through examination of the newly defined claims it is held that the following prior art rejections render the instant claimed invention obvious.

***Claim Rejections - 35 USC § 103***

13. Claims 1, 3, 4, 5, 7, and 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over EP 713258-A (EP '258) in view of JP 09-180757-A (JP '757).

EP '258 discloses a nonaqueous electrolyte secondary battery comprising a positive electrode containing active material, negative electrode containing active material which can be doped/undoped with lithium, a nonaqueous electrolyte, separator and a casing 5 (abstract and page 9, line 57 through page 10, line 31). The positive electrode comprises a positive electrode sheet, aluminum foil 11 with positive active material coated on both sides of the electrode sheet 11 (page 10, lines 17-19). The negative electrode comprises a negative electrode sheet, copper foil 10, with negative active material on both surfaces of the sheet 10 (page 10, ll. 4-6). The negative electrode active material comprises graphite with a true density of  $2/1 \text{ g/cm}^3$  a (002) interplanar distance of less than 0.340 nm (page 4, ll. 50-52) and an average value of the shape parameter X of 125 or less, the shape particle X (shape parameter X?) being equal to  $(W/T) \times (L/T)$ , W being the length of a parameter in a direction perpendicular to the longitudinal axis, T being the thickness of the thinnest portion of the particle, L being the length of the particle in the longitudinal direction (abstract and page 5, ll. 15-25), the electrodes are stacked with the separator between the electrodes and rolled to form spirally wound electrodes (page 10, ll. 23-26), the spirally wound electrodes accommodated within casing 5 (page 10, ll. 23-26). A nonaqueous electrolyte is provided to the battery (page 10, ll. 27-31 as applied to claim 1).

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The positive electrode active material comprises a lithium containing metal oxide of  $\text{LiCoO}_2$  (page 10, ll. 7-19 and page 7, ll. 34-37 as applied to claim 4).

The positive electrode active material comprises  $\text{LiCoO}_2$  as discussed above and is representative of a composite oxide of lithium and a transition metal by the general formula  $\text{LiM}_x\text{O}_y$ , wherein M is at least one selected from the group consisting of Co, Ni, Mn, Fe, Al, V and Ti (page 10, ll. 7-19 and page 7, ll. 34-37 as applied to claim 5).

In the event that the term carbonaceous in claim 7 is representative of the specific graphite as recited in claim 1, the graphite material of EP '258 as discussed above is exemplary of a specific carbonaceous material (as applied to claim 7).

The electrolyte salts include  $\text{LiClO}_4$ ,  $\text{LiAsF}_6$ ,  $\text{LiPF}_6$ ,  $\text{LiBF}_4$ , etc. (page 8, ll. 17-19 as applied to claim 11).

The differences between claims 1, 3, 9 and 10 and EP '258 are that EP '258 does not teach of the electrolyte consisting of the additive materials recited in claim 1 in the percentage weight set forth therein, of the specific thiol materials of claim 3), of the electrolyte being a polymer electrolyte (claim 9), of the particular polymer matrix additives (claim 10).

With respect to using the a solid electrolyte of JP '757:

EP '258 does not provide sufficient disclosure of a polymer electrolyte and would appear to employ a liquid electrolyte (see page 10, ll. 27-31).

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JP '757 teaches of using a solid electrolyte (abstract). JP '757 further recognized that a solid electrolyte is more reliable and safer than solution electrolytes and is not at risk to electrolyte spilling, leakage or loss as are problematic with liquid electrolytes (translated paragraph [0002] as applied to claim 9).

The polymer matrix can be polyacetonitrile (translated paragraph [0020] as applied to claim 10).

The motivation for using the solid electrolyte materials of JP '757 is that it provides an electrolyte which is more reliable and safer than solution electrolytes and is not at risk to electrolyte spilling, leakage or loss as are problematic with liquid electrolytes.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of EP '258 by using a solid electrolyte and matrix as taught by JP '757 since it would have provided an electrolyte which is more reliable and safer than solution electrolytes and is not at risk to electrolyte spilling, leakage or loss as are problematic with liquid electrolytes.

In selecting the solid electrolyte of JP '757 for the added benefits set forth above, it would have been obvious then to provide an electrolyte having an additive therein comprising a material selected from the group consisting of thiols, thiophenes, thioanisoles, thiazoles, thioacetates and aromatic sulfones in the range of 0.03- 10 wt % of the electrolyte (claim 1). More clearly:

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JP '757 is drawn to a nonaqueous electrolyte lithium secondary battery having a thiophene additive to in the electrolyte (abstract). The thiophene is in a weight percentage from 0.05-5 percent by weight based upon the total weight of the electrolyte (abstract as applied to claim 2).

The motivation for adding the thiophene additive to the electrolyte as taught by JP '757 is that it improves the affinity of the solid electrolyte to the active material of the electrodes and improves the power generating ability and battery cycle characteristics of the battery (abstract).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of EP '258 by using the solid electrolyte of JP '757 which comprised a thiophene additive to the electrolyte since it would have improved the affinity of the solid electrolyte to the active material of the electrodes and improved the power generating ability and battery cycle characteristics of the battery.

With respect to claim 3:

While claim 3 defines the particular of the thiol, claim 3 does not positively require that the thiol is selected from the group of materials in claim 1. It merely serves to further define the thiol species set forth in claim 1 without clearly stating that the thiol in claim 3 is positively chosen as the additive material. The prior art selects another material (thiophene) and claim 3 does not further limit the thiophene. The limitations of

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claim 3 would only be accorded weight provided that claim 3 clearly limited the thiol as the material added to the electrolyte (as applied to claim 3).

As discussed above JP '757 discloses adding a thiophene additive to the electrolyte.

The motivation for adding the thiophene additive to the electrolyte as taught by JP '757 is that it improves the affinity of the solid electrolyte to the active material of the electrodes and improves the power generating ability and battery cycle characteristics of the battery (abstract).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of EP '258 by using the solid electrolyte of JP '757 which comprised a thiophene additive to the electrolyte since it would have improved the affinity of the solid electrolyte to the active material of the electrodes and improved the power generating

14. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over EP '258 in view of JP '757 as applied to claim 1 above, and further in view of U.S. patent No. 6,030,726 (Takeuchi).

The difference not yet discussed is of the negative electrode active material further comprising at least one metal which alloys with lithium (claim 6).

Takeuchi discloses of providing a negative electrode material which further has a metal additive for alloying with lithium (paragraph bridging columns 6 and 7).

The motivation for adding a metal to the graphite active material in the negative electrode are the discharging capacity is increased, (2) the output power density is

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improved, (3) the electroconductivity is improved, and the charging-discharging velocity is increased, (4) a charging-discharging capacity exceeding the theoretical capacity of graphite, can be obtained, because the charging-discharging capacity of the alloy formed by the additive metal with lithium can be utilized, (5) the irreversible capacity can be reduced, because reaction sites on the surface of the carbon particles, which cause the irreversible capacity, are covered with the borne metal, (6) the output power density of the battery is naturally increased, because the discharging capacity is increased, (7) the cycle characteristics are improved with the improvement (2), and thermal radiation of a batteries can also be improved.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of EP '258 by adding a lithium alloying metal to the graphite active material in the negative electrode since it would have increased the discharge capacity, improved the output power density, improved the electroconductivity, increased the charging-discharging velocity, obtained a charging-discharging capacity exceeding the theoretical capacity of graphite, reduced the irreversible capacity, improved the cycle characteristics and thermal radiation of the battery.

15. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over EP '258 in view of JP '757 as applied to claim 1 above, and further in view of JP 08-007886-A (JP '886).

In the alternative that the term "carbonaceous material" in claim 7 is a further carbonaceous material, the claimed limitations are further obvious as set forth herein.

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The difference not yet discussed is of the negative electrode active material further comprising a crystallized or amorphous metal oxide (claim 7).

JP '886 discloses of adding a metal oxide (inherently either crystalline or amorphous) to graphite active material in the negative electrode (abstract)

The motivation for adding a metal oxide to the graphite active material in the negative electrode is that it slows the final discharge stage of the battery which permits easier detection of the remaining capacity of the battery.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of EP '258 by adding a metal oxide to the graphite active material in the negative electrode since it would have slowed the final discharge stage of the battery and permitted easier detection of the remaining capacity of the battery.

### ***Response to Arguments***

16. Applicant's arguments with respect to claims 1, 3-7 and 9-11 have been considered but are moot in view of the new ground(s) of rejection.

The amendment further defines claim 1. Through examination of the newly defined claims it is held that the following prior art rejections render the instant claimed invention obvious.

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**Conclusion**

17. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregg Cantelmo whose telephone number is (571) 272-1283. The examiner can normally be reached on Monday through Thursday from 8:00 a.m. to 5:30 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan, can be reached at (571) 272-1292. FAX communications should be sent to FAX number: (703) 872-9306. FAXES received after 4 p.m. will not be processed until the following business day. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (571) 272-1700.


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Gregg Cantelmo  
Patent Examiner  
Art Unit 1745

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